B. Workforce Profile

The Solid Waste Management Board is currently staffed with thirty-five professional/technical positions. The majority of the professionals have backgrounds and experience in engineering, physical science, or economics. The following table illustrates the distribution of professional/technical positions by occupational types.

TABLE XVII

CALIFORNIA SOLID WASTE MANAGEMENT BOARD

Current (1976) Staffing Level

Position	1976
Engineer	9
Other	26
TOTAL	35

The Other category includes six administrators, six solid waste specialists, four resource economists, two planners, and eight student assistants. The Board support staff consists of ten clerical positions. Turnover in the Board is relatively low, averaging two percent annually, except for the student assistant positions which average fifty percent annually. The low turnover is attributed to good working conditions and general satisfaction with program operations. New employees are recruited through the state Civil Service System.

For purposes of examining the solid wastes related workforce profile within the state, the program has been divided into four categories: sanitary landfills, hazardous wastes, collection systems, and resource recovery programs.

There are 428 sanitary landfills within the state. The Board uses a landfill classification system which was developed by the State Water Resources Board. The system is based upon the type and quality of geological and man-made conditions which protect the vertical and lateral continuity into usable surface and groundwater sources. There are four basic classes of landfills. The California State Board of Health has a second type of landfill classification system which is based upon usage. The Solid Waste Management Board is developing a classification system for landfills which will integrate the specifications of both the Water Resources Board and the Board of Health. The sanitary landfills are both privately and publicly owned.

The state has eleven operational hazardous waste sites. These sites are classified as Type I Disposal Sites. In addition to these eleven sites, fifty sites may receive limited quantities of certain types of environmentally dangerous wastes. These sites are classified as Class II-1 Disposal Sites. In August, 1976, the California State Solid Waste Management Board prepared for the legislature a report on the disposal of environmentally dangerous wastes in California. The report contained both maps illustrating the locations of these sites and tables which defined the facility name, location, operating agency, and type of waste accepted. The map and table for both Class I and Class II-1 sites are include with this report. The report also included information explaining the estimated production of environmental dangerous waste by county. The accompanying table which estimates the total industrial waste, wastewater treatment sludge, and pesticide containers produced by county is also include with this report. The Class I and Class II-1 Disposal sites are both privately and publicly operated.

FIGURE 3

STATE OF CALIFORNIA

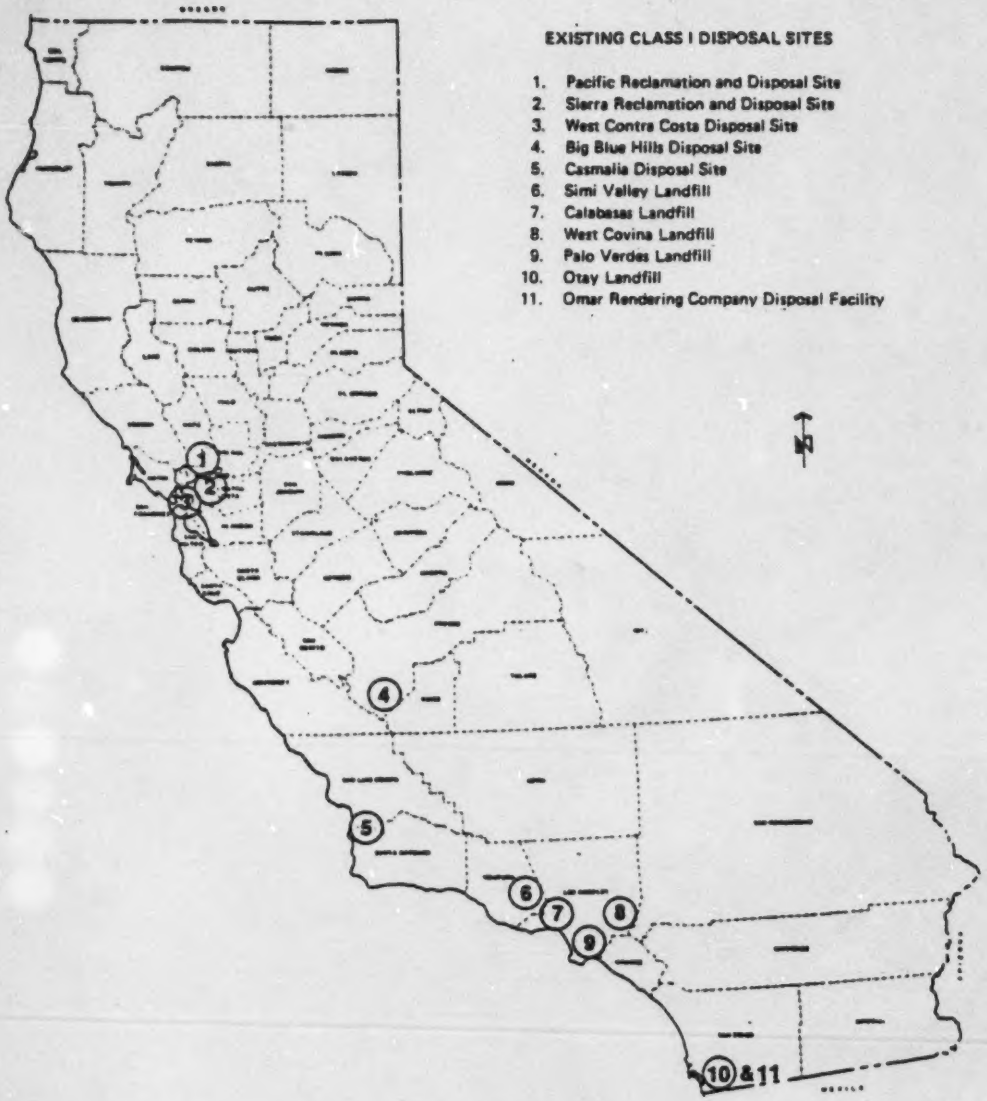

TABLE XVIII

STATE OF CALIFORNIA

Existing Class 1 Disposal Sites

Site Number	Site Name	Operator	Location	Primary Service Area	Types of Wastes Accepted
1	Pacific Reclamation and Disposal Site	Pacific Disposal Systems, Inc.	Solano County	Northern California	Liquids and sludges only.
2	Sierra Reclamation and Disposal Site	Pacific Disposal Systems, Inc.	Contra Costa County	Northern California	Limited liquids and sludges. No volatile materials.
3	West Contra Costa Disposal Site	Richmond Sanitary Service	Contra Costs County	Northern California	Liquids, sludges, and solid wastes.
4	Big Blue Hill Disposal Site	Fresno County Dept. of Public Works	Fresno County	San Joaquin Valley	Limited sludges, pesticide containers and solids.
5	Casmalia Disposal Site	Kenneth R. Hunter, Jr.	Santa Barbara County	Santa Barbara, San Luis Obispo, Kern Counties	Liquids, sludges, and pesticide containers.
6	Simi Valley Landfill	Ventura Regional County Sanitation District	SE Ventura County	Ventura and Los Angeles Counties	Liquids, sludges, and solid wastes. No volatile materials.

TABLE XVIII

(continued)

Site Number	Site Name	Operator	Location	Primary Service Area	Types of Wastes Accepted
7	Calabasas Landfill	Los Angeles County Sanitation District	Los Angeles County	Los Angeles County	Liquids, sludges, and solid wastes.
8	West Convina Landfill	BKK Corporation	Los Angeles County	Los Angeles, Riverside, and San Bernardino Counties	Liquids, sludges, and solid wastes.
9	Palos Verdes Landfill	Los Angeles County Sanitation District	Los Angeles County	Los Angeles and Orange Counties	Liquids, sludges, and solid wastes. No acid or volatile materials.
10	Otay Landfill	San Diego County Disposal Division	San Diego County	San Diego and Imperial Counties.	Liquids, sludges and solid wastes. No acid volatile material.
11	Omar Rendering Company Disposal Facility	Omar Rendering Company	San Diego County	San Diego and Imperial Counties	Liquids and slurries. No oily wastes. No acids or volatiles.

TABLE XIX

STATE OF CALIFORNIA

Existing Class II-1 Disposal Sites

Facility Name	Location	Operating Agency	Type of Waste Accepted
Sheepy Ridge Solid Waste Disposal Site	Siskiyou County	City of Tulelake	Empty Pesticide Containers Selected materials
Sonoma County Site	Sonoma County	Sonoma County	Drilling Mud, Pesticide Containers
Macii State No. 1	Mendocino County	Sun Oil Company	Drilling Mud
Sump Torchio and Ferro No. 2	Mendocino County	Sun Oil Company	Drilling Mud
Disposal Sumps	Sonoma County	Pacific Energy Company	Petroleum Fractions, Drilling Mud Additives
Disposal Sumps	Sonoma County	Shell Oil Company	Petroleum Fractions, Drilling Mud Additives
Disposal Sumps	Contra Costa County	Union Oil Company	Petroleum Fractions, Drilling Mud Additives
Acme Field Lanfill	Contra Costa County	Acme Corporation	Oil Wastes, Drilling Mud
Ash Hill	San Bernardino County	Santa Fe Railroad	Oil Sludge

TABLE XIX

(continued)

Facility Name	Location	Operating Agency	Type of Waste Accepted
Hollister - San Benito County Refuse	San Benito County	City of Hollister	Munitions Plant Wastes, Sludges, Heavy Metals, Acetone Wastes
Sludge Disposal for Districts 26 and 32	Los Angeles County	Los Angeles County Sanitation District	Wastewater Treatment Sludges
Operating Industries, Inc. Landfill	Los Angeles County	Operating Industries, Inc.	Liquids, Drilling Mud
Spadra	Los Angeles County	Los Angeles County Sanitation District	Liquids
Puente Hills	Los Angeles County	Los Angeles County Sanitation District	Liquids
Eastlake Sanitation Landfill	Lake County	Lake County Department of Public Works	Pesticide Containers
Geothermal Operations	Lake County	Union Oil Company	Drill Muds
WW Disposal Facility	Placer County	Auburn Sanitary Landfill	Sanding Dust, Cleanup Liquids from Melamine Treaters
Flannery Road Mud Disposal	Solano County	Aqua Clear Farms	Waste Drilling Muds

TABLE XIX

(continued)

Facility Name	Location	Operating Agency	Type of Waste Accepted
Solid Waste Disposal Facility	Yolo County	Yolo County Central Landfill	Pesticide Containers
Evans Road Landfill	Colusa County	Colusa Co. Public Works	Pesticide Containers
Stonyford Landfill	Colusa County	Colusa Co. Public Works	Pesticide Containers
Buena Vista Landfill	Amador County	Amador County	Pesticide Containers
Class II-1 Solid Waste Disposal	San Joaquin County	Foreward, Inc.	Pesticide Containers
Environmental Disposal Service	Fresno County	McKay Trucking	Oil Sump Sludge, Brine and Drilling Mud
Disposal Facility	Kern County	M.P. Oil Company	Oil Wastes
Eastside Disposal Farm	Kern County	McKay Trucking	Oil Wastes
Westside Disposal Farm	Kern County	McKay Trucking	Oil Wastes
Disposal Facility	Kern County	Diversified Chemical Corporation	Oil Wastes
Elk Hill Disposal Site No. 1	Kern County	Williams Brothers	Oil Wastes

TABLE XIX

(continued)

Facility	Location	Operating Agency	Type of Wastes Accepted
Elk Hills Disposal Site N. 2	Kern County	Williams Brothers	Oil Wastes
Kerto Disposal Facility	Kern County	Williams Brothers	Oil Wastes
McKittrick Solid Waste Disposal Site	Kern County	Williams Brothers	Oil Wastes
Liquid Waste Disposal	Kings County	McKay Trucking	Oil Wastes
Disposal Facility	Kings County	Kings Waste Disposal Company	Oil Wastes
Beacon Oil Company Kettleman	Kings County	Beacon Oil Company	Oil Wastes - related
Standard Oil	Kings County	Standard Oil	Oil Wastes
Sanitary Landfill	Lassen County	Lassen County Solid Wastes	Pesticide Containers
Solid Waste Disposal Site	Inyo County	Union Carbine Corporation	Sodium Sulfate Slurry
Brine Disposal	San Bernardino Co.	City of Barstow	Brine
Fort Irwin Road SWDS	San Bernardino Co.	Atchison, Topeka and Santa Fe Railroad	Oil Sludge

FIGURE 4

STATE OF CALIFORNIA

Class II-1 Disposal Sites

TABLE XX

STATE OF CALIFORNIA

Estimated Production of Environmental Dangerous Wastes by County

County	Industrial	Wastewater Treatment Sludge	Pesticide Containers	Totals
Alameda	144,200	226,600	14	370,800
Alpine	none	100	1	100
Amador	unknown	3,200	1	3,200
Butte	unknown	23,800	33	23,800
Calaveras	unknown	3,300	1	3,300
Colusa	unknown	2,500	28	2,500
Contra Costa	309,600	123,600	14	433,200
Del Norte	100	3,200	1	3,300
El Dorado	none	11,100	1	11,100
Fresno	6,300	91,800	221	98,300
Glenn	none	3,700	20	3,700
Humboldt	unknown	21,300	1	21,300
Imperial	22,300	16,500	750	39,600
Inyo	unknown	3,600	0	3,600
Kern	69,200	71,300	1,700	142,200
Kings	5,100	13,800	51	19,000
Lake	none	5,000	4	5,000
Lassen	none	3,900	1	3,900
Los Angeles	287,800	1,421,600	135	1,709,500
Madera	58,000	9,300	101	67,400

TABLE XX

(continued)

County	Industrial	Wastewater Treatment Sludge	Pesticide Containers	Totals
Marin	unknown	44,700	21	44,700
Mariposa	none	1,600	1	1,600
Mendocino	none	11,900	6	11,900
Merced	unknown	23,700	165	23,900
Modoc	none	1,600	2	1,600
Mono	unknown	6,900	1	6,900
Monterey	14,500	55,800	181	70,500
Napa	14,400	18,600	12	33,000
Nevada	none	5,700	1	5,700
Orange	679,700	351,500	416	1,031,600
Placer	70	19,200	3	19,300
Plumas	unknown	2,800	0	2,800
Riverside	unknown	108,200	73	108,300
Sacramento	6,500	142,900	13	149,400
San Bernardino				213,200
San Diego	12,300	323,000	31	335,300
San Francisco	15,700	137,900	1	153,600
San Joaquin	7,200	63,400	239	70,600
San Luis Obispo	1,400	26,000	20	27,400
San Mateo	19,100	117,400	4	136,500
Santa Barbara	3,500	58,200	61	61,700
Santa Clara	23,800	249,000	19	272,800
Santa Cruz	400	31,400	36	31,800

TABLE XX

(continued)

County	Industrial	Wastewater Treatment Sludge	Pesticide Containers	Totals
Shasta	none	18,100	6	18,100
Sierra	none	500	1	500
Siskiyou	unknown	7,300	2	7,300
Solano	120,000	37,000	39	157,700
Sonoma	900	51,500	12	52,400
Stanislaus	11,000	44,100	221	55,300
Sutter	unknown	9,400	60	9,500
Tehama	unknown	6,600	10	6,600
Trinity	80	1,900	1	2,000
Tulare	unknown	42,500	173	42,700
Tuolumne	none	5,600	1	5,600
Ventura	20,700	91,600	214	112,500
Yolo	300	21,500	68	21,900
Yuba	unknown	9,200	17	9,200

There are a total 596 collection systems within the state. The systems are both publicly and privately owned and operated. No information is available on the percentage of the firms privately or publicly operated.

There are no existing resource recovery programs within the state. However, within the next two to three years, two sites are planned for operation. The sites will be located in the San Francisco Bay area and in the San Diego area.

No information is currently available on the number of employees working in the sanitary landfills, hazardous waste sites or in collection activities. Likewise, there is little information on turnover or career potential for the field. However, the Solid Waste Management Board indicated that starting in July, 1977, Local Solid Waste Enforcement Agencies will be created within each county. The Board anticipates that within 18 months of the implementation of this program the state would have available information on staffing levels and occupational types in each of the areas of concern.

C. Workforce Projections

The California Solid Waste Management Board anticipates major growth during the coming five years. During 1977, the Board projects a 100% increase in staff. From 1977 through 1982, the Board estimates an annual average growth of 27%. The following table depicts this growth rate in terms of staffing requirements.

TABLE XXI

CALIFORNIA SOLID WASTE MANAGEMENT BOARD

Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Engineer	9	18	20	22	24	26	2%	28%
Other	26	52	56	62	67	72	2%*	27%
TOTAL	35	70	76	84	91	98	2%*	27*

*The student assistant turnover rate is not included within the turnover rate calculation. Permanent staff have an average turnover rate of 2%. The student assistant employees, temporary workers, have an average annual turnover rate of 50%

The clerical positions are expected to grow at the same rate as the professional/technical staff. This growth pattern reflects the increased program responsibilities of the agency specifically in the areas of resource recovery and the provision of technical assistance to the local counties in the development of the local solid waste enforcement agencies.

Moderate growth is predicted within the private sector sanitary landfills, hazardous waste programs, resource recovery operations, and collection system programs. The exact amount of annual growth cannot be determined accurately. The growth will be directly related to population growth and industrial expansion.

D. Training and Certification

The State of California does not currently offer a sanitary landfill operator training program. However, the state is considering developing a program within the next five years. No consideration has been given to offering training or certification programs in the area of hazardous waste, collection system management, or resource recovery.

E. Career Potential

Career prospects within the solid waste management field are strong. Major growth is predicted for the state and local agencies as a direct consequence of the Resource Conservation and Recovery Act and the implementation of the Local Solid Waste Enforcement Agency program. During 1977, the staff of the California Solid Waste Management Board is expected to double. Between 1977 and 1982, the Board also predicts an annual increase of 27 percent.

Moderate growth is predicted for the solid waste management private sector programs. No estimate is currently available on the average annual growth for the sanitary landfills, hazardous waste, resource recovery, and collection system programs.

Upgrade opportunities and career potential for sanitary landfill operators are generally considered as limited. However, with available on-the-job training, most solid waste program employees are able to obtain higher paying jobs in related occupations such as heavy equipment operators within the construction industry. While there are no distinctly unique emerging occupations in this field, the existing landfill occupations may be altered to enable the landfills to accomodate other types of materials than those currently handled.

Career opportunties within the hazardous wastes and resource recovery fields are considered to be extremely bright. This projection is generally based upon the anticipated impact of the Resource Conservation and Recovery Act.

The career potential for collection system workers is considered limited. There is little upward mobility or skill transferance to other occupations. During the next five years, a moderate growth in available positions is anticipated. Such growth will be directly attributable to growth in population.

F. Conclusion

Three conclusions may be made following a review of workforce projections for the solid waste management programs in the State of California:

1) that the California Solid Wastes Management Board will experience major growth during the next five years; this growth is related to the expansion of technical assistance to the counties and to the Resource Conservation and Recovery Act;

2) that occupations within the hazardous wastes and resource recovery fields have strong career potential and that during the next five years, numerous employment opportunties will be emerging; this growth will be attributable to the impact of the Resouce Conservation and Recovery Act;

3) that occupations within the sanitary landfill operations and solid waste collection systems have a limited career potential and that during the next five years a moderate number of new employment opportunities will be created; this growth will be a consequence of increase in population.

Training programs for the technical occupations are generally not available in California. Educational institutions have not extensively explored solid waste training programs. With the growth in this field, educational institutions might well review technical training opportunties.

CALIFORNIA SOLID WASTE MANAGEMENT BOARD

ORGANIZATIONAL CHART

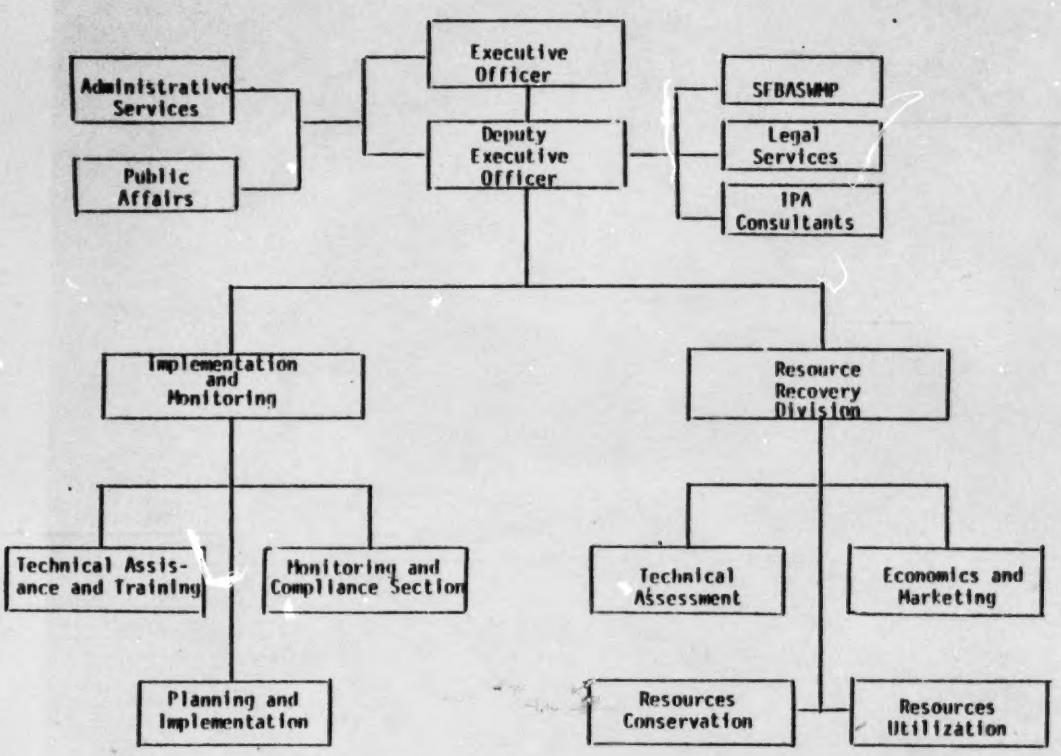

Figure 5

VII. WASTEWATER

A. Introduction

The California State Water Resources Control Board is the principal wastewater environmental regulatory agency in the state. The basic responsibility of the Board is to protect surface waters and ground waters of the state from pollution sources of all types in order to provide suitable water quality for all beneficial uses. The numerous responsibilities of the Board can be summarized into four basic programs:

1) Local Assistance: Grants for Clean Water
2) Water Quality Planning
3) Waste Discharge Requirements and Enforcement
4) Water Rights.

Under the Local Assistance program the Board administers the Clean Water Grant Program which provides state and federal funds for upgrading, expanding and consolidating waste treatment plants to meet minimum state and federal requirements.

The Board is the state lead agency for water quality planning efforts mandated by both state and federal laws. The Board develops basin plans which set water quality objectivies and recommends programs to achieve the objectives on a basinwide basis. The Board also provides assistance to designated local planning agencies in the development of areawide waste management plans.

The Board, in coordination with the Regional Water Quality Control Boards, issues waste discharge requirements to all dischargers who affect water quality, including both surface and ground waters. The Board administers a surveillance and monitoring program which checks for compliance, conducts aerial surveillance and coordinates data from other state and federal agencies. The enforcement activities include issuance of administrative cleanup orders and/or referral to the Attorney General for court action.

Under its Water Rights Program the Board processes applications for use of unappropriated water in California. The Board also conducts adjudications of water use, as a part of its water rights process, and by request of the courts. In addition, the Board records water extractions and diversions in Riverside, San Bernardino, Los Angeles, and Ventura Counties.

B. Workforce Profile

The California State Water Resources Control Board is staffed with a total of 496 professional/technical positions and 190 clerical positions. The following table provides a breakdown of the professional/technical positions by occupational type.

TABLE XXII

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

Staffing Level (1976)

Position	1976
Administrative	65
Biologist	54
Engineer	278
Engineering Technician	30
Analyst	53
Attorney	15
Other	1
TOTAL	496

The Other category represents an operations specialist. The administrative category includes state and regional board executive officers, division chiefs, their assistants, regional administrative officers, business service officers and their assistants. The Analyst category includes all statistical processing, governmental program staff services, personnel, budget, and similar such programs.

The State Water Resources Control Board has a central administrative branch and five administrative divisions. The five divisions are: the legal division, the consolidated administrative services, the division of water quality, the division of planning and research, and the division of water rights. In addition to the five divisions, the Board has nine regional offices. The staffing for these divisions and regional offices is as follows:

TABLE XXIII

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

Staffing by Branch (1976) est.

Branch	1976
Executive Branch	27
Legal Division	36
Consolidated Administrative Services	75
Division of Water Quality	126
Division of Planning and Research	70
Division of Water Rights	54
North Coast Region	17
San Francisco Bay Region	40
Central Coast Region	18
Los Angeles Region	44
Central Valley Region	53
Lahontan Region	16
Colorado River Basin Region	14
Santa Ana Region	18
Santa Diego Region	15

Position vacancies are filled through the state Civil Service System.

During 1976, the State Water Resources Control Board has made great strides toward complying with PL 92-500. Much of the first phase of the Federal Act has been implemented: water quality control plans have been adopted for all areas of the state and NPDES permits specifying 1977 levels of required treatment have been issued to all surface water discharges. Eight 208 Planning grants were awarded in the state. Grant recipients included the State Water Resources Control Board and seven regional agencies. The following is a list of the seven 208 primary planning agencies:

1) Association of Bay Governments, Berkeley;
2) Assoiciation of Monterey Bay Area Governments, Monterey;
3) Comprehensive Planning Organization of San Diego County, San Diego;

4) Sacramento Regional Area Planning Commission, Sacramento;
5) Southern California Association of Governments, Los Angeles;
6) Tahoe Regional Planning Agency, South Lake Tahoe;
7) Ventura Regional County Sanitation District, Ventura.

With the exception of the Tahoe Regional Planning Agency, the 208 Planning programs in these agencies will operate through 1978. The Tahoe Program has been operational for two years, and is currently operating on a six month program extension.

The following table represents the cumulative number of employees in these agencies that are directly involved with 208 Planning.

TABLE XXIV

STATE OF CALIFORNIA

Section 208 Planning Agencies
Staffing Level (1976)

Position	1976
Engineer	21
Attorney	6
Planner	19
Conservationist	1
TOTAL	47

The local agencies have made contract awards to other municipal agencies. These agencies have estimated that an additional 73 persons may be employed under these contracts. These positions represent varied environmental disciplines.

There are two state analytical laboratories which have responsibility for aspects of water quality analysis: the state analytical laboratory for the California Department of Fish and Games and the Marine Bio Assay

Laboratory. These two laboratories have similiar responsibilities which include:

1) determination of cause and effect of pollutants and toxic substances on fish and wildlife;

2) provision of technical assistance to persons in the field in the prevention and solving of problems related to the impact of pollutants and toxic substances upon fish and wildlife;

3) conducting research on special problems regarding toxic substances effects upon fish and wildlife.

In general, the Fish and Game Laboratory focuses its program efforts upon inland streams and waters, while the Marine Bio Assay Laboratory is concerned with ocean and estuary habitats. The Marine Bio Assay Laboratory is currently staffed with 21 professionals: 15 field wardens and 6 biologists. The Fish and Game Laboratory has a total staff of 12: 1 administrator, 1 special project coordinator, 4 chemists, 3 biologists, 2 technicians, and 1 secretary. Turnover at both laboratories is minimal. The Marine Bio Assay Laboratory has no turnover. This is correlated with general satsifaction with job realted activities and working conditions. The Fish and Game Laboratory has a turnover of no more than one person per year. As with the Bio Assay Laboratory, the Fish and Game Laboratory attributes its low employee turnover to general job satisfaction. New employees are recruited through the State Personnel Office.

Wastewater training programs are offered at numerous locations throughout the state. The most prominent program is available through the San Marcos Training Center. The Center is staffed with a director, two

training coordinators, an instructor on loan from Palomar College, a supervision plant operator, and a secretary. Comprehensive training programs are also offered through five community colleges: Orange Coast, Santa Ana, Contra Costa, Sacramento City, and Sierra. There are total of nine instructors involved with training at these programs. While other colleges within the state offer sporadic training programs, no information is available on the number of persons involved with the programs.

There are approximately 735 municipal wastewater treatment plants in the state. Municipal wastewater treatment plants are classified into five categories:

1) Class I - Plants having stabilization ponds and using primary treatment with a Design Flow of 1.0 MGD or less.

2) Class II - Plants using extended aeration, primary treatment with a Design Flow of greater than 1.0 MGD or less than 5.0 MGD or biofiltration of 1.0 MGD or less.

3) Class III - Plants having primary treatment of 5.0 MGD to 20.0 MGD, biofiltration of 1.0 MGD to 10.0 MGD, activated sludge of 5.0 MGD or less or tertiary treatment of 1.0 MGD or less.

4) Class IV - Plants having primary treatment of greater than 20.0 MGD, biofiltration of 10.0 MGD to 30.0 MGD, activated sludge of 5.0 MGD to 20.0 MGD, or tertiary treatment of 1.0 MGD through 10.0 MGD.

5) Class V - Plants having biofiltration treatment of greater than 30.0 MGD, activated sludge of greater than 20.0 MGD, and/or tertiary treatment of greater than 10.0 MGD.

There are an estimated 250 Grade I, 210 Grade II, 200 Grade III, 50 Grade IV, and 25 Grade V plants.

A total of 7,655 persons are employed in municipal wastewater treatment systems. Of these employees, 4,000 are operators: 398 line maintenance/uncertified operators, 870 Grade I, 1,160 Grade II, 730 Grade III, 361 Grade IV, 181 Grade V, and 300 Operators in Training. The remaining 3,655 employees include administrators, chemists, and maintenance persons.

Turnover in the Class I systems is relatively high with an average annual turnover rate of 15%. The Class II systems experience an estimated 10% per annum turnover. The Class III and IV systems have reasonably stable staffs; the average annual turnover is approximately 5 percent. The Class V systems have minimal turnover with an estimate of 2% or less per year. The turnover in the lower plant classifications is an indication of upward mobility. Many of the operators, once they become trained and have gained the requisite experience, can obtain higher paying jobs at upper level plants.

There are an estimaed 750 direct industrial dischargers within the state. Of these dischargers, the most prominent sources are the oil manufacturers and canning industries. The oil manufacturers are concentrated in the San Francisco Bay area and near Los Angeles. The canning industries figure prominently in the San Joaquin Valley and Fresno area. Of the 750 dischargers, about 250 operate supervised treatment plants. The state does not operate a classification system for industrial waste treatment plants. No specific information is readily available on the number of employees in the industrial waste treatment system;

however, it is estimated that the plants are frequently operated by a crew of two to three employees. The crew is generally composed of one supervisor and one or two operators. Turnover within the industrial wastewater treatment facilities is considered to be minimal.

C. Workforce Projections

Over the next five years, it is estimated that the California State Water Resources Control Board will increase its staffing by not more than 1% annually. This growth will reflect expansion of staff to address increased service demands. No amplification of existing programs is planned. The following table depicts the growth of the Board by occupational type:

TABLE XXV

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

Workforce Projections to 1982 (est.)

Positions	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Administration	65	65	67	68	70	70	1%	2%
Biologist	54	55	56	57	58	60	1%	1%
Engineer	278	281	283	286	289	292	5%	1%
Engineering Technician	30	31	32	33	34	35	0	3%
Analyst	53	53	54	54	55	56	1%	1%
Attorney	15	15	15	16	16	17	1%	1%
Other	1	1	1	1	1	1	0	0
TOTAL	496	501	508	515	523	531	n/a	1%

The clerical support staff will continue to grow at the same rate as the professional and technical staff. The 190 clerical positions will be increased to 199 by 1981. The growth approximates 1% per annum.

The future status of the state and local 208 planning effort is considered as tentative. Through 1978, the staffing levels of the programs will remain stable. Between 1979 and 1981, continued staffing of the planning programs will be entirely dependent upon local funding. It is not likely that local communities will be able to fund large-scale planning programs without additional federal assistance.

Growth within the Marine Bio Assay Laboratory and the California Department of Fish and Games will be limited during the next five years. The directors of the laboratories were hesitant to make any future staffing projections. They indicated that future expansion of their programs will generally be related to availability of funds through grants and contracts. They were unable to state what types of grants and contracts they would be considering.

The San Marcos Training Center will be adding a staff position during 1977. The Center proposes to hire an assistant coordinator for the new mobile lab. Other than this one position, the Center was hesitant to project any other staff increases during the next five years. Turnover within the Center is minimal, with an average of one person leaving each year. As vacancies occur, advertisements are placed in national professional journals. Referrals are also accepted through professional organizations.

The private sector workforce requirements will grow steadily during the next five years. The following table illustrates the anticipated growth by occupational type.

TABLE XXVI

STATE OF CALIFORNIA

Municipal Wastewater Treatment Plant Operators
Workforce Projections to 1982 (est.)

Position	1976	1977	1978	1979	1980	1981	%/annum turnover (average)	%/annum growth (average)
Operator								
Grade I	870	930	973	1,015	1,058	1,100	15%	5%
Grade II	1,160	1,160	1,173	1,232	1,291	1,350	10%	3%
Grade III	730	730	730	734	767	800	5%	2%
Grade IV	361	361	361	387	419	450	5%	4%
Grade V	181	190	211	232	253	275	2%	3%
In-Training	300	412	459	506	553	600	n/a	15%
Maintenance/ Uncertified	398	398	398	398	398	398	n/a	0
Other*	3,655	3,863	4,130	4,320	4,476	4,632	n/a	5%
TOTAL	7,655	8,044	8,435	8,824	9,215	9,605	n/a	5%

*Other includes administrators, chemists, and maintenance personnel.

The primary factor responsible for growth within the municipal waste treatment plants will be increased demands for service resulting from growth in population.

Growth is anticipated within the industrial sector. It is estimated that staffing requirements for the industrial waste treatment facilities will increase by approximately 5 to 10 percent per annum. This expansion will be related to increased production and to the increased cost of treatment charged to the industries by the local municipalities.

D. Training and Certification

The State of California has a broad based wastewater training program. Programs are available through many of the state community colleges and through the San Marcos Training Center. Courses are available not only for the wastewater treatment plant operator, but also for program administrators, maintenance personnel, grant writers, and safety specialists.

The most comprehensive training program is available through the San Marcos Training Center. The Center is operated by the California State Water Resources Control Board. In 1971, the Board and the Environmental Protection Agency realized that operator training was not being addressed adequately by the existing training program. In response to this need, the Board funded the operation of the San Marcos Training Center. In March 1975, the first class received training.

Facilities at the Center include an administration-classroom building, a 300,000 gallon-per-day activated sludge treatment plant and a mobile laboratory. During 1977, the Center will be adding a second mobile training unit.

The Center currently offers fifty training courses; however, not all fifty courses are available during a given quarter. The Center staff also serve as instructors at local seminars and workshops. In addition, the staff provides technical assistance to local communities in solving wastewater related problems. The enrollment of the Center has experienced a steady growth over the past five years. During 1977, it is estimated that 650 persons will attend programs offered through the Center. The staff will also provide instruction to an additional 2,000 persons through special community seminars and workshops.

During 1976 the following courses were offered:

1) Introduction to Wastewater Mathematics; offered twice during 1976; enrollment 32.

2) Advanced Wastewater Mathematics; offered once during 1976; enrollment 9.

3) Laboratory Analysis: Procedures and Interpretation of Results; offered twice during 1976; enrollment 30.

4) Laboratory Operation/Plant Control; offered ten times during 1976; enrollment 118.

5) Laboratory Mathematics; offered once during 1976; enrollment 8.

6) Plant Evaluation and Assistance for Regulatory Agencies; offered once during 1976; enrollment 15.

7) Wastewater Collection System Maintenance; offered once during 1976; enrollment 15.

8) Phase I. Techniques of Instruction for Personnel Responsible for In-Plant Training; offered once during 1976; enrollment 6.

9) Pump Theory and Operation; offered twice during 1976; enrollment 52.

10) Activated Sludge; offered once during 1976; enrollment 12.

11) Wastewater Treatment Plant Operation, Emphasis: Introduction to Plant Operations; offered twice during 1976; enrollment 31.

12) Wastewater Plant Operations, Emphasis: Activated Sludge; offered once during 1976; enrollment 20.

13) Wastewater Treatment Operations, Emphasis: Lagoons and Oxidation Ponds; offered once during 1976; enrollment 34.

14) Water Quality Biology; offered once during 1976; enrollment 10.

15) Water Grants; offered once during 1976; enrollment 29.

16) Instructor Workshop; offered once during 1976; enrollment 5.

17) Aerial Surveillance/Enforcement Photography; offered once during 1976; enrollment 12.

18) Toxicity Bio Assay Workshop; offered once during 1976; enrollment 12.

19) Mobile Wastewater Technology; offered four times during 1976; enrollment 67.

Enrollment in training programs is expected to grow steadily during the next five years. During 1978-79, the program is expected to experience significant increases as the second mobile laboratory is opened. The Center did not make any estimates on the amount of the expected increase.

Training is also available through five community colleges in the state: Orange Coast, Santa Ana, Contra Costa, Sacramento City, and Sierra. These colleges offer ongoing wastewater and water treatment programs. Cumulatively, these colleges train an average of 650 additional operators annually. A steady growth in enrollment is projected for these courses during the next five years.

Other of the 106 community colleges in the state offer sporadic training programs. No information is currently available on the number of operators trained through these programs.

E. Career Potential

Career opportunties within the state operated wastewater programs will be rather limited during the next five years. All occupations within the California State Water Resources Control Board will grow no more than 1-2% annually. This growth requirement is associated with increased

demands for service under existing programs. There will be limited expansion of staff within the state analytical laboratories for the State Department of Fish and Games and the Marine Bio Assay Laboratory. No program diversification is planned, with the exception of the laboratories' efforts to secure special funded projects. Any staff expansion will be a direct consequence of acquiring such projects.

The 208 Planning Projects will remain stable through 1978; however, the future of the programs following the demise of federal funds is tenuous. However, staff members are actively pursuing private sector funding sources.

The municipal wastewater treatment facilities in the state will experience an average annual growth in staffing of about 5%. This growth is attributed to an increase in population and its consequent increase in demands for service.

Upward mobility within the lower classifications of municipal waste treatment plants is strong. The degree of mobility is evidenced by the higher turnover rates in the lower plant classifications and the more stabilized turnover in the Class IV and V plants.

There will be an average growth of from 5 to 10 percent annually in the demand for operators and supervisors in the industrial waste treatment facilities. The demand will be a consequence of muncipalities increasing the charges to industries for treatment of industrial wastes.

F. Conclusion

During the next five years, the wastewater control workforce within the State of California will experience a significant increase as the state integrates the requirements of P.L. 92-500 into its existing programs structures. This exapansion will assert continuing demands upon the state training programs. Advanced training programs will be needed to educate engineers, geologists, and planners in the fundamentals of wastewater treatment. The community colleges will be asked to train more operators, supervisors, engineering technicians, and maintenance workers.

In conclusion, it is evident that the growth patterns in the wastewater pollution control field are directly related to the requirements of federal legislation, i.e., P.L. 92-500. While there is no apparent emerging legislation in this field, any new legislation introduced during the next five years would certainly alter the workforce projections in that there would be a probable increase in all occupational levels in both the private and public sectors.

WATER RESOURCES CONTROL BOARD

ORGANIZATIONAL CHART

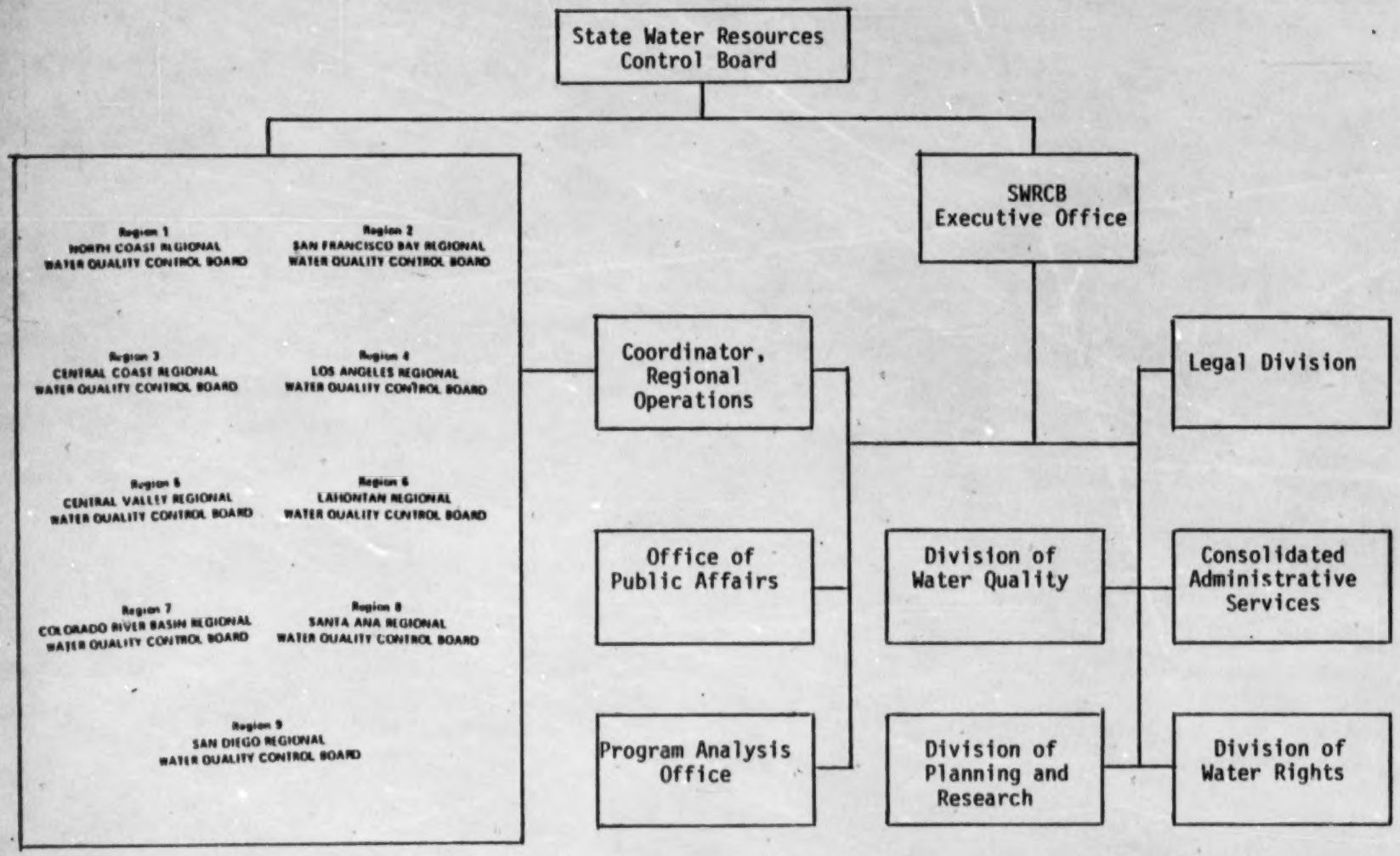
State Water Resources Control Board
SWRCB Executive Office
Region 1 NORTH COAST REGIONAL WATER QUALITY CONTROL BOARD
Region 2 SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD
Region 3 CENTRAL COAST REGIONAL WATER QUALITY CONTROL BOARD
Region 4 LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD
Region 5 CENTRAL VALLEY REGIONAL WATER QUALITY CONTROL BOARD
Region 6 LAHONTAN REGIONAL WATER QUALITY CONTROL BOARD
Region 7 COLORADO RIVER BASIN REGIONAL WATER QUALITY CONTROL BOARD
Region 8 SANTA ANA REGIONAL WATER QUALITY CONTROL BOARD
Region 9 SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD
Coordinator, Regional Operations
Legal Division
Office of Public Affairs
Division of Water Quality
Consolidated Administrative Services
Program Analysis Office
Division of Planning and Research
Division of Water Rights

Figure 6

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VIII. ENERGY

A. Introduction

With the recognition that energy is essential to the health and welfare of the state and its economy, the California State Legislature enacted the Warren-Alquist State Energy Resources Conservation and Development Act in May, 1974. The Act provided for the establishment of the State Energy Resources Conservation and Development Commission. The Commission is the principal state lead agency for energy program coordination and planning.

The Warren-Alquist Act delegated the Commission the following basic responsibilities:

1) to undertake a continuing assessment of trends in the consumption of electrical energy and other forms of energy and to analyze the social, economic, and environmental consequences of these trends;

2) to carry out or cause to carry out energy conservation measures and make recommendations to the Governor and Legislature concerning new and expanded energy conservation measures;

3) to prepare, with the assistance of electric utilities, gas utilities, fuel producers and wholesalers, and other sources, forecasts of future energy supplies, of future energy or fuel production and transportation facilities to be constructed, and of consumption patterns of all forms of energy;

4) to analyze such forecasts in relation to statewide estimates of population, economic, and other growth factors, and also in terms of the availability of energy resources, costs to consumers, and other factors;

5) to administer, under contract or other arrangements, research and development into alternative sources of energy, improvements in energy generation, transmission and siting, fuel substitution, and other topics related to energy supply, demand, public safety, ecology and conservation;

6) to administer the power facility and site certification program to include adopting standards to be met in designing and operating a facility, prescribing the form and content of application for facilities, evaluation of policies governing the establishment of rates, and serving as a repository for the collection and storage of data and information on all forms of energy supply, demand, conservation, public safety, and related subjects.

These responsibilities have been concisely categorized as Energy Shortage Contingency Planning, Forecast and Assessment, Conservation, Power Facility and Site Certification, and Research and Development.

Under its Energy Shortage Contingency Planning Program the Commission develops plans to deal with possible shortages of energy and fuel supplies. (In developing these plans, the Commission requests that the electric and gas utilities, fuel wholesaler and manufacturer submit information on proposed energy laod curtailment plans or emergency energy supply distribution plans. This information will be used for identifying loads or users in case of sudden interruption or shortage of power.)

The Forecast and Assessment Program requires that all electrical utilities in the state submit a report every two years to the Commission specifying 5-, 10-, and 20-year forecasts on assessments of loads and resources for its service area. The reports include information on the following:

1) estimated peak loads, resources, and reserve margins;

2) existing and needed electrical generating plants and facilities;

3) an estimation of the availability of and cost of fuel resources;

4) a description of projected growth influencing increased demand for electrical energy and the basis for such projection.

The forecasts are reviewed and evaluated according to population growth estimates, land use, transportation, economic development programs and forecasts, the environment, the public health, and the state's economy.

Under the Conservation Program a balanced use of energy is encouraged. The Commission conducts an ongoing assessment of the opportunities and constraints presented by all forms of energy. In addition, studies and research are conducted to assess the supply and demand of energy resources and to reduce non-feasible uses of energy.

By law, the Commission has the exclusive power to certify all sites and related facilities in the state. These certification activities are included under the Commission's Power Facility and Site Certification Program.

The responsibilities of the Commission under its Research and Development Program include developing and coordinating a program in research and development of alternative sources and conservation of energy. The Commission directs research into alternative energy sources of particular interest to California, such as solar, geothermal, and nuclear energy.

B. Workforce Profile

Pursuant to the enactment of the Warren-Alquist State Energy Resources Conservation and Development Act, the governor organized and appointed members to the State Energy Resources Conservation and

Development Commission. The Commission is a five member board subject to appointment by the Governor. The Act stipulates the background and experience of each member:

1) one member of the Commission shall have a background in the field of engineering or physical science and have knowledge of energy supply and conversion systems;

2) one member shall be an attorney and a member of the State Bar of California with administrative law experience;

3) one member shall have background and experience in the field of environmental protection or the study of ecosystems;

4) one member shall be an economist with background and experience in the field of natural resource management;

5) one member shall be from the public at large.

The Secretary of the Resources Agency and the President of the Public Utilities Commission are ex-officio, non-voting members of the Commission.

The members of the Commission are appointed for five year terms. The terms of the members are staggered so that no more than one member of the Commission retires during a given year.

The Executive Office of the Commission consists of nine offices and five divisions. The nine offices include: the Office of the Executive Director, the Office of the Commissioner, the Office of the Secretariat, the Office of Policy and Program Assessment, the Office of Nuclear Program Assessment, the Office of Information and Education, the Office of the Public Adviser, the Office of the General Counsel, and the Office of Governmental Affairs.

The Executive Director's Office provides the information link between the policy board and the executive office. Responsibilities of this Office include the following:

1) to continually evaluate and modify staff programs and priorities to meet the Commission goals;

2) to negotiate and discuss with federal, city, and county governments, and state agencies the successful coordination and implementation of energy programs;

3) to present staff proposals to the Commissioners for review and approval;

4) to meet with members of the public, representatives of various interest groups and utility liaisons to ensure the flow of information regarding current Commission programs;

5) to oversee daily operations of the divisions and the Director's Office staff functions.

The Office of Policy and Program Evaluation has been delegated the following four major areas of responsibility:

1) to analyze and evaluate existing and proposed programs and main projects;

2) to evaluate impacts of state and federal policies effecting production, transportation, processing and use of fossil fuels and other energy sources sand develops policy and program recommendations in areas where the Commission has general energy analysis, planning and advisory responsibilities;

3) to analyze changes or trends in state and federal environmental policies and develops procedures for integrating environmental assessment with policy, planning, and project approval processes;

4) to supervise and integrate the mandated Biennial Report to the Governor and Legislature.

Responsibilities for informing the public of all relevant Commision meetings and hearings is vested in the Office of the Secretariat. Included in its responsibilities are the maintenance of the Master Calendar of Commission activities and a record tabulation of proceedings that terminate in committee or full Commission hearings.

A total of eight nuclear power generating facilities are operational or will be operational by 1982. Cumulatively, the eight nuclear power generating facilities have a potential nuclear generating capacity of 7,606 net megawatts. Six additional nuclear facilities are proposed with a net generating capacity of 7,600 megawatts. To ensure the health and safety of the residents of California, the Nuclear Assessment Program Office has been assigned the following duties:

1) to conduct analyses and investigation into the status of the technologies and federal approvals for nuclear fuel rod reprocessirg and disposal of high-level nuclear waste;

2) to perform studies relevant to the feasibility, effectiveness, and necessity for undergrounding or berm containment of nuclear plants;

3) to conduct staff analysis of whether to adopt regulations requiring the nuclear power plants to be either undergrounded or berm contained;

4) to provide technical assistance to the Energy Facility Siting Division to review the factors related to safety and reliability of the facilities at each site designated in a Notice of Intent for nucler power plants.

The Office of the Commissioner consists of the five members of the Commission and the supportive technical staff.

The Office of the Public Advisor ensures that full and adequate participation is secured in all of the programs and proceedings of the Commission. Responsibilities of the Office include implementing measures for participating which include ensuring that timely and complete notice is disseminated to all interested groups and to the public at large; advising such groups and the public as to effective means of participating in the Commission's proceedings; recommending to the Commission additional measures to assure open consideration and public participation in energy planning, site and facility certification, energy conservation, and emergency allocation proceedings.

Legal support for all Commission activities is provided through the Office of the General Counsel. Functions of the Office include participating in the processing of power plant applications; drafting regulations and orders relating to the Commission's statutory obligations in the fields of energy conservation, energy supply and demand assessment, and resource development; analyzing legislation; and representing the Commission before Federal and State Agencies and Boards.

Public awareness and support of Commission programs is essential to the success of the comprehensive energy planning and program process. The Office of Information and Education has as its primary responsibility the preparing and dissemination of summaries, brochures, and news releases to increase public awareness and understanding of Commission activities, policies, and programs. Through the use of media communication techniques, the Office informs the public of upcoming Commission meetings, hearings, and workshops.

The Office of Governmental Affairs coordinates activities, information, legislation, and personal contacts between the Energy Commission and other state agencies, the Legislature, regional, county, and local governments, and other states' energy agencies, federal agencies, Congress and the Administration. The Office apprises Commission staff and the Commissioners of the availability of publications and legislation and the occurrence of meetings, hearings, conferences or personal contacts relating to energy issues and activities of governmental organizations.

The preceding nine offices have a cumulative staffing level of 85.8 persons, which includes: 51 professionals, 25 clerical positions, and 9.8 temporary workers. The following table provides a breakdown of the 51 professional positions by occupational type.

TABLE XXVII

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

Administrative Offices
Current (1977) Staffing Level

Position	1977
Administrator	15
Staff Services Analyst	4
Energy Resource Specialist	11
Attorney	16
Other	5
TOTAL	51

The Other category includes two public advisers, one research specialist, one editorial technician, and one information officer.

The five principal divisions of the Commission Executive Office are: the Energy Assessment Division, the Conservation Division, the Energy Facility Siting Division, the Alternatives Implementation Division, and the Division of Administration. Cumulatively, these divisions are staffed with 487 persons: 362 professional/technical positions, 96 clerical positions, and 29 temporary workers. The following table provides a review of the professional and technical positions by occupational type:

TABLE XXVIII

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

Program Divisions
Current (1977) Staffing Level

Position	1977
Administrator	31
Staff Services Analyst	57
Energy Resource Specialist	165
Planner	27
Operations Specialist	25
Statistical Analyst	5
Engineer	16
Other	36
TOTAL	362

The Other category includes 1 Accountant, 2 Management Analysts, 2 Budget Analysts, 1 Administrative Analyst, 2 Librarians, 1 Supervisor of Technical Publications, 1 Surplus Property Coordinator, 1 Personnel Analyst, 1 Artist, 1 Data Processing Analyst, 4 Programmer Analysts, 5 Government Program Analysts, 3 Engineering Geologists, 2 Research Specialists, 1 Research Writer, 1 Information Officer, 1 Geologist, 1 Research Manager, 4 Research Analysts, and 1 Land and Water Use Analyst.

The Commission was able to provide a detailed occupational analysis of each of the five divisions. There are 60 persons employed in the Administrative Services Division, 112 in the Energy Assessment Division, 110 in the Facility Siting Division, 72 in the Alternative Implementation Division, 134 in the Conservation Division. The following tables provide a review of the staffing configuration of each division.

TABLE XXIX

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

Division of Administrative Services
Current (1977) Staffing Level

Position	1977
Administrator	6
Staff Services Analyst	1
Energy Resource Specialist	2
Management Analyst	2
Budget Analyst	2
Librarian	2
Other	8
TOTAL	23

TABLE XXX

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

Alternative Implementation Division
Current (1977) Staffing Level

Position	1977
Administrator	5
Staff Services Analyst	6
Energy Resource Specialist	36
Engineer	1
Other	6
TOTAL	54

TABLE XXXI

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

Energy Facilities Siting Division
Current (1977) Staffing Level

Position	1977
Administrator	6
Staff Services Analyst	20
Energy Resource Specialist	35
Planner	25
Engineer	4
Other	2
TOTAL	92

TABLE XXXII

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

Conservation Division
Current (1977) Staffing Level

Position	1977
Administrator	7
Staff Services Analyst	20
Energy Resource Specialist	43
Planner	1
Operations Specialist	24
Engineer	7
Other	3
TOTAL	105

TABLE XXXIII

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

Energy Assessment Division
Current (1977) Staffing Level

Position	1977
Administrator	7
Staff Services Analyst	10
Energy Resource Specialist	49
Planner	1
Engineer	4
Operations Specialist	1
Statistical Analyst	5
Research Analyst	4
Programmer Analyst	3
Other	4
TOTAL	88

Sources within the Commission provided the following summary statements concerning the responsibilities for each of the five divisions:

1) Energy Assessment Division: The Division makes independent staff forecasts of electricity demand and critically evaluates utility demand forecasting; analyzes technical, economic, and fuel-related aspects of electric supply; and integrates environmentally-sensitive long-range planning into the Commission's policy and regulation activities.

2) Conservation Division: The Division's policies and programs are designed to eliminate energy waste, improve energy efficiency, reduce the level and rate of energy growth, manage electrical load patterns, and assist other state and local governmental agencies involved in transportation and land-use planning.

3) Energy Facility Siting Division: The certification of electrical generating power plant sites and related facilities is the major responsibility of this Division.

4) Alternatives Implementation Division: The Division is responsible for the Comission alterative energy resource program. The goal of the program is to make available and promote the use of new energy systesm.

5) Division of Administrative Services: The Division porvides all organizational components of the Energy Commission with a full range of administrative, business, and office services required to accomplish the primary responsibilities of meeting the goals of the Commission.

In total, the Commission is currently staffed with 573 positions. This number accounts for 487 persons in the five divisions and 86 staff members in the nine program offices. The Commission was unable to provide information on the turnover rates for the individual occupational types or for the Commission as a whole, Nevertheless, sources at the Commission indicated that they believe that attrition for the Commission was average as compared to other agencies with a similar number of employees. All new employes are recruited through the State Civil Service System.

Comprehensive information on the workforce situation for the private sector is not available. Most utility companies in the state have environmental components. Two of the major utilities in the state were surveyed concerning their environmentally related activities. The two utilities interviewed are Southern California Edison Company and Pacific Gas and Electric Company.

Pacific Gas and Electric Company has a total of 165 full-time employees who perform environmentally related activities. The Company has a designated Environmental Quality Office. The Office was created in an effort to facilitate the coordination of environmental programs and activities. The Office is staffed with a director, four technical specialists, and two secretaries. Four other departments provide major support to the environmental program effort including the Department of Civil Engineering, Arechitectural Section; Siting Division, Department of Engineering Research; and Land Department. The four departments contribute 160 staff persons to the environmental effort. The following table provides a staff breakdown of the Environmental Quality Office and the previously mentioned offices by occupational type.

TABLE XXXIV

PACIFIC GAS AND ELECTRIC COMPANY

Environmentally Related Staff
Current (1976) Staffing Level

Position	1976
Administrator	1
Architect	6
Engineer	85
Biologist	10
Chemist	2
Metalurgist	1
Geologist	1
Health Physicist	2
Nuclear Physicist	1
Programmer	1
Engineering Assistant	1
Laboratory Technician	13
Technical Specialist	4
Clerical	2
Other	35
TOTAL	165

Numerous other departments are fully involved with environmental activities. For example, the Law Department is intensively involved in matters concerning licensing and environmental law; the Mechanical and Nuclear Engineering Department is involved in design of radiation-waste systems for power plants; the Accounting Department is designing accounting systems for research and development and environmental expenditures; the Public Relations Department is involved in communicating to the public the environmental accomplishments of the company; and the Materials Department is involved in procurement of low-sulfur oil. No estimate of environmental workforce commitment for each of these Departments is currently available.

The Company was not able to provide information on turnover rate for each occupation type nor for the company as a whole. However, the Company considers its turnover rate as minimal.

The Southern California Edison Company also has an operable environmental component. Most environmental concerns are handled through the Environmental Planning Department. The Department identifies and evaluates environmental issues, legislation and trends, assesses environmental feasibility of facility plans, prepares environmental impact reports, and recommends and assists in developing environmental objectives, policy, research and development, and related public relations programs. The Department is staffed by 21 persons including a variety of engineering disciplines, a geographer, a geologist, and archaeologist, two biologists, an oceanographer, environmental analyst, and scientist.

In addition to the Environmental Planning Department, four other programs contribute efforts to the environmental program: the Engineering and Construction Department, the Power Supply Department, the Research and Development Department, and the Corporate Communications Department.

The Engineering and Construction Department assists in the development of long-range resource programs and conducts applied research and development of environmental control systems, engages in geologic, hydrologic, and meteorologic engineering studies, monitors environmental effects of generating plans on air and water quality, and provides support in obtaining licensing.

The responsibility for environmental factors in operation of steam and hydro-generating facilities including dams, reservoirs and waterways is under the Power Supply Department. The Research and Development

Department is responsible for activities directed toward the development of new technology responsible to present and future environmental problems. The Corporate Communications Department is the principal source of public information on company environmental policy and actions, and costs for environmental protection. No figures were provided by the Company on the environmental workforce allocations within each of these Departments.

Due to the size of the company, the utility does not maintain records on turnover rate for either the individual occupations or for the company in total. However, the utility estimated that the turnover rate was minimal.

C. Workforce Projections

During the next five years the Energy Resources Conservation and Development Commission is not expected to substantially grow in staffing.

The Commission indicated that the national reorganization of energy programs being conducted by the Carter Administration would have a major influence upon state energy programs during the next five years. However, sources at the Commission indicated that it was premature to speculate on the nature of the impact or on the consequent changes in programs, activities, or workforce requirements.

Significant changes are also projected for the private sector programs. In a report published by the United States Department of The Interior entitled, Projects to Expand Fuel Sources in Western States

(May, 1976), California was noted as having 36 fuel source expansion projects planned: 29 electric power plants, 5 geothermal facilities, and 2 oil refineries. Of the 29 electric power plants planned, 13 will be powered by fuel oil, 6 by nuclear power, 6 by hydro-power, 1 by coal, 2 by geothermal, and 1 yet to be determined. As these expansions become operational, additional staff with diverse environmental expertise will be required. No further estimate is available on the number of persons required or the percent of increase in the total environmental-energy workforce.

D. Training and Certification

There are no certification programs either currently operational or planned for personnel in energy-related environmental fields. Most environmental personnel in the energy field have backgrounds in engineering, economics, biological and physical science, and planning. The traditional programs in each of these disciplines, available through the state universities and colleges, appear to be providing adequate numbers of graduates to meet the emerging workforce requirements.

E. Career Potential

The career opportunities for all levels of occupations in the energy related field appear to be extremely bright. The national reorganization of energy programs will exert a major influence upon state, local, and private sector energy programs. Sources in California indicated that they anticipate major federal support in the energy planning, conservation, and research and development fields. As funds become available to

sponsor these programs, numbers of planners, engineers, scientists, economists, and technical support personnel will be required to upgrade existing programs to meet requested federal recommendations and mandates.

F. Conclusion

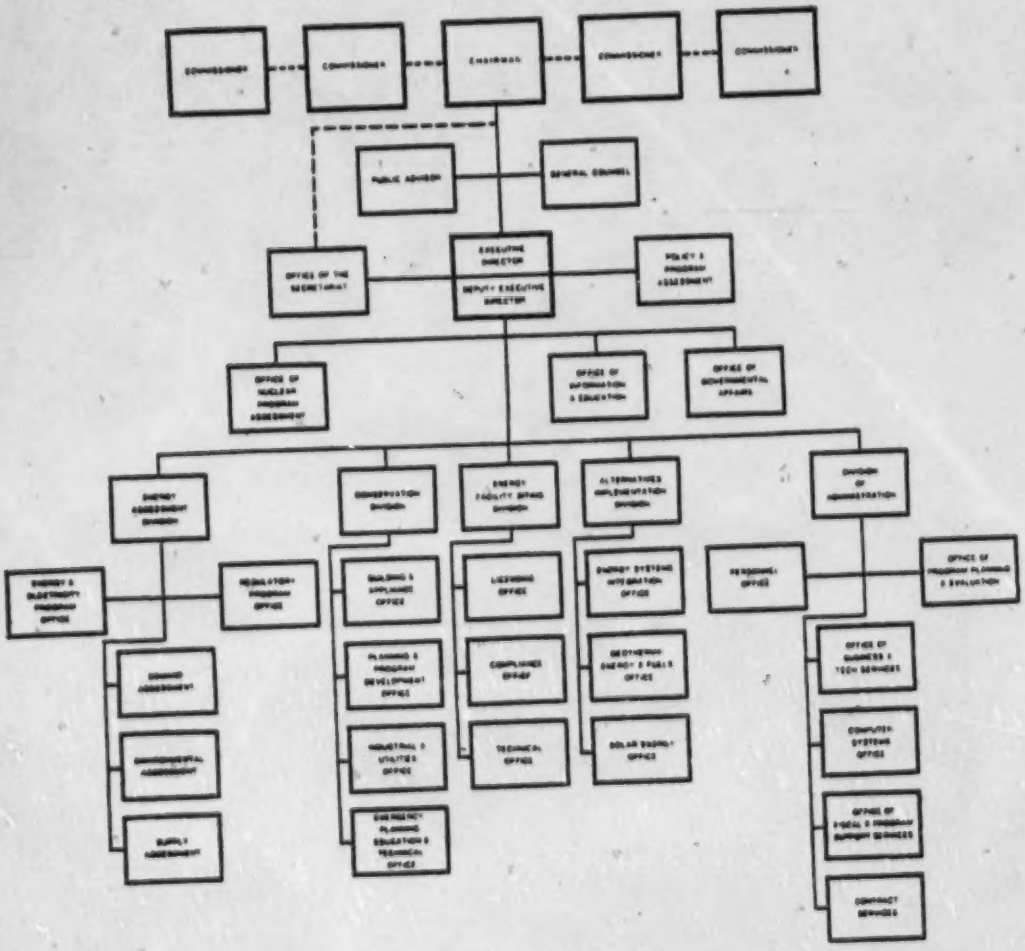
The foregoing information supports a bright future for the energy related workforce within the State of California. California has been actively pursuing internal solutions to the emerging energy problem. As early as 1974, the State Legislature recognized the need for a coordinated energy planning structure. The promulgation of the Warren-Alquist State Energy Resources Conservation and Development Act in May, 1974 marked the creation of the State Energy Resources Conservation and Development Commission. The Commission, which is currently staffed with 313 persons, is expected to experience major growth during the next five years.

Employment opportunities in the energy/environmental field in the state appear to be numerous. Nevertheless, as the utilities companies are successful in completing the proposed energy expansion plans, environmental/energy occupations will become more in demand.

The national reorganization of energy programs will be the determining factor in the percent of growth of energy programs during the next five years. Sources within the state anticipate a major growth in workforce requirements as greater support becomes available for energy planning, conservation, and research and development. Those occupations most in demand will be engineers, planners, scientists, and economists.

Figure 7

ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION ORGANIZATION CHART



Selected Post Secondary Institutions With Formal Environmental Energy Programs

Environmental education programs are offered in a number of state universities, colleges, community colleges and technical schools. Advanced degree programs are offered through the University of California at Berkeley, the University of California at Irvine, California State University at Sacramento, California State University at San Jose, and Stanford University.

The University of California at Berkeley offers M.S. and Ph.D. degrees in Sanitary Engineering. Courses are available in water, wastewater, solid waste, and air. The University of California at Irvine offers two advanced degrees in Environmental Engineering, specifically M.S. and PH.D. degrees. Select courses are offered in the study of air, water, and wastewater pollution control as well as in noise abatement and control.

California State University at Sacramento offers an M.S. degree in Civil Engineering. A variety of courses are available in water resources, air quality management, and solid waste management. An M.S. degree is Environmental Engineering is awarded by the California State University at San Jose. Basic courses are available in water resources, air pollution control and solid waste.

Stanford University has a fully developed Environmental Engineering program with both M.S. and Ph.D. degrees available. Numerous courses are offered in the areas of noise, air, water, wastewater, and planning.

Numerous community colleges in the state offer environmental education programs. The most fully developed environmental education programs are the potable water and wastewater treatment plant operator training programs. Five community colleges in the state offer ongoing training in both water and wastewater. The five colleges are Orange Coast, Santa Ana, Contra Costa, Sacramento City, and Sierra. Other community colleges in the state offer individual courses on a limited basis.

The California State Water Resources Control Board sponsors a wastewater treatment facility, the San Marcos Training Center. The Center, which has been operating since 1971, offers training programs for operators, administrators, grant writers, maintenance personnel, safety specialists, and other persons involved with all facets of wastewater treatment systems.

An indepth analysis of program offerings available through the San Marcos Training Center and California State University in Sacramento is provided in the following section.

SENIOR INSTITUTIONS

California State University
Sacramento, California

Program: Civil Engineering with Environmental Concentration (B.S.)

Hours required for major: Semester - 126
Program Inception: 1958
Staff Size: Eleven professors, three associate professors (14 Ph.D.)
Enrollment: 102
Graduates (1976): 44
Placement: 36
Graduate Work (M.S.): 4

Program: Civil Engineering with Environmental Concentration (M.S.)

Hours required for major: Semester - 30 with qualifying prerequisite degree
Program Inception: 1968
Staff Size: Two professors, one associate professor (3 Ph.D.)
Enrollment: 56
Graduates: 12
Placement: 12
Graduate Work: 0

Courses

Water Resources Engineering
Intermediate Hydraulic Theory
Sanitary Engineering
Water Quality Analysis
Water Quality Engineering Design
Urban Engineering
Atmospheric Pollution Control
Environmental Engineering
Systems Analysis
Water Quality Management and Control
Environmental Quality Treatment Procedures
Water Quality Unit Operation and Procedures
Advanced Water Quality Analysis
Solid Waste Management
Hydrology
Hydraulic Theory
Hydraulic Theory
Resource Planning
Engineering Statistics
Operations Research

Environmental Quality Management
Remote Sensing of Environmental Quality
Air Quality Measurements
Atmospheric Aerosols
Incineration, Air Pollution and Waste Disposal
Combustion
Sanitation Microbiology
Meteorology
Meteorology Laboratory
Physical Chemistry
Instrumental Technology
Environmental Impact Reports
Environmental Internship
Environmental Economics

COMMUNITY COLLEGES/TECHNICAL INSTITUTIONS

San Marcos Training Center
San Marcos, California

Program: Continuing Education Programs with emphasis in wastewater technology

Hours required for degree: Non-degree programs; offered on an individual basis.

Program Inception: varied
Staff Size: Two instructors (2 M.S.)

Courses

Introduction to Wastewater Mathematics
Hours required: 35
Enrollment: 32

Advanced Wastewater Mathematics
Hours required: 35
Enrollment: 9

Laboratory Analysis: Procedures and Interpretation of Results
Hours required: 40
Enrollment: 30

Laboratory Operation/Plant Control
Hours required: 40
Enrollment: 118

Laboratory Mathematics
Hours required: 35
Enrollment: 8

Plant Evaluation and Assistance for Regulatory Agencies
Hours required: 35
Enrollment: 15

Wastewater Collection System Maintenance
Hours required: 20
Enrollment: 15

Phase I. Techniques of Instruction for Personnel Responsible for In-Plant Training
Hours required: 35
Enrollment: 6

Pump Theory and Operation
Hours required: 18
Enrollment: 52

Activated Sludge
Hours required: 35
Enrollment: 12

Wastewater Treatment Plant Operation, Emphasis: Introduction to Plant Operation
Hours required: 35
Enrollment: 31

Wastewater Plant Operations, Emphasis: Activated Sludge
Hours required: 35
Enrollment: 20

Wastewater Treatment Operations, Emphasis: Lagoons and Oxidation Ponds
Hours required: 35
Enrollment: 34

Water Quality Biology
Hours required: 18-24
Enrollment: 10

Water Grants
Hours required: 12
Enrollment: 29

Instructor Workshop
Hours required: 12
Enrollment: 5

Aerial Surveillance/Enforcement Photography
Hours required: 18
Enrollment: 12

Toxicity Bio Assay Workshop
Hours required: 18
Enrollment: 12

Mobile Wastewater Technology
Hours required: 40
Enrollment: 67

Courses - Courses available but not offered during 1976

Wastewater Treatment Hydraulics
Wastewater Treatment Hydraulics (Advanced)
Industrial Waste Control and Management
Industrial Waste Control for Regulatory Agencies
Wastewater Treatment Plant Safety

Supervisory Training, Public Relations
Public Relations for the Water Quality Control Opeator and Supervisor
Communications and Public Relations for Regulatory Agencies
Laboratory Analysis and Bacterial Examination of Wastewater
Laboratory Analysis and the Characterization of Wastewater Constituents
Budget Preparation
Effects on Receiving Water Quality and Marine Biology Related to Ocean Outfalls
Sedimentation
Activated Sludge
Trickling Filtration
Chlorination/Disinfection
Anaerobic Digestion
Chemical Coagulation and Flocculation
Chlorine Safety
Anaerobic Digestion
Waste Treatment Ponds
Wastewater Treatment Plant Operations
Plant Operation Training in Center Facility
Biological Loading and Troubleshooting
Wastewater Plant Operations, Emphasis: Hydraulically Overloaded Facilities
Wastewater Treatment Plant Operations, Emphasis: Trickling Filtration
Wastewater Plant Operations, Emphasis: Sludge Treatment and Disposal
Wastewater Plant Operations, Emphasis: Chemical Coagulation and Flocculation
Wastewater Plant Operations, Emphasis: Calculations Involved with Each Unit Process
Advanced Wastewater Treatment Technology
Elementary Water Quality Biology
NPDES Compliance Monitoring Workshop
Clean Water Grants Program

State Legislation

TITLE:

Environmental Quality Act of 1970
California Public Resources Code 21000

PURPOSE:

To develop and maintain a high-quality environment, and to provide for the state regulation of activities in such a manner as to prevent environmental damage.

DEFINITIONS:

1. Environment
2. Environmental impact report
3. Local agency
4. Public agency
5. Project
6. Person
7. Lead agency

ADMINISTERING AUTHORITY:

Office of Planning and Research
All State and Local Governmental Units

AUTHORIZATIONS:

To adopt environmental impact report (EIR) procedures;
To develop EIR evaluation guidelines;
To prepare and submit an EIR for all projects which may have a significant environmental effect.

PROHIBITED ACTS:

To request or authorize funds for projects failing to comply with EIR requirements.

EXEMPTIONS:

Actions and projects controlled by other environmental impact requisites; emergency projects.

CALIFORNIA AIR

TITLE:

Air Pollution Control Laws
California Health Code 39000

PURPOSE:

To provide for safeguarding the physical environment of the state through on intensive, coordinated effort to protect and enhance the ambient air quality of the state.

DEFINITIONS:

1. Agricultural burning
2. Air basin
3. Air contaminant
4. Ambient air quality standards
5. Bay district
6. Bay district board
7. Bus
8. Certification
9. Certified device
10. Combustible solid waste
11. Commercial vehicle
12. County district
13. County district board
14. Crankcase emissions
15. District
16. District board
17. Emission standards
18. Exhaust device
19. Exhaust emissions
20. Flue
21. Fuel evaporative loss emissions
22. Fuel systems
23. Heavy duty
24. Implement of husbandry
25. Light duty
26. Limited-production vehicle
27. Local authority
28. Model year
29. Motor vehicle
30. Motor vehicle pollution control device
31. Motorcycle
32. New vehicle
33. Nonvehicular source
34. Open outdoor fire
35. Orchard or citrus grove heater
36. Passenger vehicle
37. Person
38. Racing vehicle
39. Regional district
40. Regional district board
41. Schedule
42. Solid waste dump
43. State board
44. Truck
45. Truck tractor
46. Unified district
47. Unified district board
48. Used vehicle
49. Vehicle
50. Vehicular sources

ADMINISTERING AUTHORITY:

Air Resources Board
Resources Agency
Air Pollution Control Districts

AUTHORIZATIONS:

To issue regulations pursuant to the act regarding ambient air quality standards;
To develop a state implementation plan;
To limit air emissions to attain higher air quality;
To conduct air pollution research;
To divide the state into air basins and supervise local air pollution control districts;
To secure air pollution data through monitoring;
To administer air pollution funds;
To provide motor vehicle air emission standards;
To issue permits for air contaminant discharges.

PROHIBITED ACTS:

To discharge air contaminants in violation of ambient air quality standards;
To engage in open, nonagricultural burning;
To fail to comply with vehicular emissions standards.

EXEMPTIONS:

Certain allowed fires and agricultural burning, cooking fires;
Livestock operation odors;
Vehicles and certain non-commercial items (from permit requirement);
Racing vehicles and motorcycles (from motor vehicle emissions standards).

PENALTIES:

Violations are misdemeanor;
Willful violations - civil penalty of fine up to $6,000.
Motor vehicle emissions - fines of up to $50 per vehicle.

CALIFORNIA NOISE

TITLE:

Noise Control Act of 1973
California Statutes, Section 46000

PURPOSE:

To provide for effective coordination of noise control activities to provide an environment free from noise that jeopardizes health or welfare.

DEFINITIONS:

1. Local agency
2. Noise
3. Office
4. Public agency
5. State agency

ADMINISTERING AUTHORITY:

Office of Noise Control

AUTHORIZATIONS:

To undertake noise control studies and effects;
To assist in local noise ordinance preparation;
To monitor noise levels;
To develop standards for noise-producing objects in the state;
To cooperate with federal agencies in noise area.

CALIFORNIA PESTICIDES

TITLE:

California Agricultural Code
California Statutes 11401

PURPOSE:

To provide for a comprehensive system of pesticide and pesticide applicator control through registration and certification.

DEFINITIONS:

1. Agricultural pest control
2. Advisor
3. Agricultural use
4. Commissioner
5. Environment
6. Judgement
7. License
8. Operator
9. Pest Control
10. Pest control operation
11. Pesticide
12. Pesticide dealer
13. Registrant
14. Recommendation

ADMINISTERING AUTHORITY:

Department of Agriculture
Agricultural Pesticide Advisory Committee

AUTHORIZATIONS:

To enforce pesticide safety and registration requirements;
To issue regulations pursuant to the act;
To license agricultural pest control applicators, pesticide dealers, and control advisors;
To classify pests, pesticide, and pesticide users;
To establish certification standards.

CERTIFICATION OR LICENSING:

Dealers, advisors and applicators must show qualifications to be licensed. Can qualify for categories which are established. County registration is also required.

PROHIBITED ACTS:

To engage in activity as dealer, advisor or applicator without proper license;
To fail to comply with all regulations of the act;
To fail to keep necessary records.

EXEMPTIONS: Structural pest control operators.

CALIFORNIA POTABLE WATER

TITLE:

Water Systems and Operators Law
California Health Code 4026

PURPOSE:

To ensure the safety of public water supplies and to provide for operator certification of such facilities.

DEFINITIONS:

1. Reservoir
2. Public agency
3. Advisory Committee
4. Certificate
5. Operator
6. Water treatment plant

ADMINISTERING AUTHORITY:

Department of Health
Advisory Committee on Certification

AUTHORIZATIONS:

To formulate rules and standards for domestic water supplies;
To undertake testing and sampling activity of water supplies;
To provide for customer notification of poor water quality;
To certify operators of water treatment plants;
To establish and assist in filling educational standards;
To classify water treatment facilities.

CERTIFICATION OR LICENSING:

All water system operators must be certified in classification corresponding to the facility; provision to waive examination for existing operators.

PROHIBITED ACTS:

To operate a water treatment facility without properly certified operator;
To engage in operator activity without proper certification.

CALIFORNIA RADIATION

TITLE:

Radiation Control Law
California Health Code 25800

PURPOSE:

To provide for the regulation of sources of ionizing radiation for the protection of public health and safety.

DEFINITIONS:

1. Secretary
2. Ionizing radiation
3. Person
4. Byproduct material
5. Source material
6. Special nuclear material
7. General license
8. Specific license
9. Registration

ADMINISTERING AUTHORITY:

Resources Agency

AUTHORIZATIONS:

To license byproduct, source, and special nuclear materials;
To issue regulations concerning the control of radiation sources;
To collect information on ionizing radiation sources;
To develop standards for issuance of general and specific licenses;
To enter into agreements with state and federal agencies;
To issue emergency radiation orders.

PROHIBITED ACTS:

To manufacture, produce, use or possess any radioactive or similar materials without a proper license.

PENALTIES:

Fines of up to $500 or 180 days in jail.

NRC AGREEMENT STATE: Yes

CALIFORNIA SOLID WASTE

TITLE:

Solid Waste Management and Resource Recovery Act
California Statutes, Section 66700

PURPOSE:

To establish and maintain a comprehensive solid waste management and resource recovery policy to manage solid waste so as to protect public health, safety, and well-being, to preserve the environment, and to provide for the maximum reutilization and conversion for other uses of resources contained therein.

DEFINITIONS:

1. Board
2. Council
3. Department
4. Disposal facility
5. Disposal site
6. Enforcement agency
7. Hazard
8. Operator
9. Person
10. Pollution
11. Processing
12. Regional planning agency
13. Resource recovery program
14. Solid waste
15. Solid waste disposal
16. Solid waste facility
17. Solid waste handling
18. State policy
19. Transfer/processing station

ADMINISTERING AUTHORITY:

Solid Waste Management Board
Department of Health

AUTHORIZATIONS:

To formulate and adopt state policy for solid waste management, including standards for solid waste handling, disposal and reduction of pollution;

Counties to prepare local solid waste management plan consistent with state policy;
To administer federal funds in the area;
To provide technical assistance to local agencies;
To administer permit program for solid waste facilities.

PROHIBITED ACTS:

To establish solid waste sites not in conformance with solid waste plans and policies;
To operate solid waste facility without proper permit.

EXEMPTIONS:

Nonprofit recycling groups

CALIFORNIA WASTE WATER

TITLE:

Porter-Colgne Water Quality Control Act
California Water Code 13000

PURPOSE:

To provide for the conservation, control and utilization of water resources of the state; and to protect and enhance the water quality of the state.

DEFINITIONS:

1. State board
2. Regional board
3. Person
4. Waste
5. Waters of the state
6. Beneficial uses
7. Quality of the water
8. Water quality objectives
9. Water quality control
10. Contamination
11. Pollution
12. Nuisance
13. Reclaimed water
14. Citizen or domiciliary
15. Liquid waste

ADMINISTERING AUTHORITY:

Waste Resources Control Board
Resources Agency
Regional Water Quality Control Boards

AUTHORIZATONS:

To act as the state lead agency in water pollution matters;
To develop a state policy for water quality control;
To conduct water pollution research and investigations;
To administer a permit program for water discharges;
To classify waste water treatment facilities for operator certification;
To adopt water discharge requirements;
To control liquid waste hauling and disposal.

PROHIBITED ACTS:

To discharge wastes into waters of the state without a permit;
To fail to file necessary reports;
To discharge any radiological, chemical, or biological warfare agent into waters of the state;
To cause or contribute to water pollution;
To violate other provisions or rules of the act.

PENALTIES:

Violations constitute misdemeanor; fines of up to $6,000 and $10,000.